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ASSESSMENT OF WASTE HEAT MANAGEMENT ISSUES

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Assessment of Waste Heat Management Issues

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The Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) defined the discharge of cooling water, e.g. from once-through power plant cooling systems, into natural water bodies as a form of pollution. Furthermore, P.L. 92-500 directed the U.S. Environmental Protection Agency to develop a policy for controlling this "pollution" with "best available technology economically achievable" by 1983 for old sources and with "best available demonstrated control technology" taking "into consideration the cost of achieving such effluent reduction, and any non-water quality environmental impact and energy requirement" for new sources. In addition, the law provided for special exemptions, Section 316(a), from these regulations for waste heat sources which could show that they have had or will have no appreciable effect on the ecology of the water body.

The purposes of this project element are (a) to assess present EPA policy and administrative actions regarding waste heat management and (b) to determine if this policy is really protecting the aquatic environment with the least possible increase in other social costs, including energy use, pollution in other media, and administrative effort.

In July 1977 a draft discussion paper on national waste heat management issues (Publication 5a) was prepared. This paper was developed from a critical review of over 125 papers found in the open literature. The policy areas evaluated in the survey were: federal water pollution control legislation; federal agencies involved in waste heat regulation; current EPA waste heat regulations; judicial review of EPA waste heat regulations; economic effects of waste heat management;

primarily from once-through cooling systems; and beneficial uses of waste heat.

The literature survey and evaluation have lead to two primary conclusions on waste heat management. The first conclusion is that the biological impacts of existing power plants using once-through cooling systems on large bodies of water are poorly defined and often difficult to detect; there is a lot of uncertainty about the effects but the risk of irreversible environmental damage is probably slight in most instances. Some local damage has been reported but there is a lack of evidence of large scale, irreversible ecological damage caused by the current population of power plants with once-through cooling systems.

However, this is not to say there is no danger associated with once-through cooling systems. Most of EPA's waste heat management policy is directed toward reducing damage to the local aquatic environment. It is now believed that damage within once-through cooling systems to planktonic organisms, such as eggs and larvae, sucked into the intakes may have a more important effect on population dynamics than damage from the warm water plumes discharged into the water body. Very little appears in the literature on the cumulative effects from more than one power plant on a water body. If the stability of large scale ecosystems of water bodies is important, it would seem that such cumulative effects may well be the most important ones to consider in the future, especially in closed or semi-closed ecosystems such as in lakes, rivers and estuaries.

The second conclusion is that it appears that EPA policy has been to make it very difficult to apply for Section 316 waivers, but quite possible to get them. In spite of the fact that large-scale ecosystem harm due to currently operating power plants has not been shown, expensive and time-consuming tests of noninterference with local environment were required of them. The situation is similar for new plants, except in these cases it is the projected operation which must be shown not to interfere with the local environment. For nuclear power plants the process is even stricter since they must pass an NRC review

procedure which is dependent on, but does not totally overlap the EPA review. In practice, after much paper work and, sometimes, much expensive delay, most once-through systems have been granted exemptions from the no-discharge regulation.

As a result of this policy, there appears to be a great deal of confusion on the part of the utilities as well as the public. This has resulted in extra costs to society in the forms of power plant delays, hearings, court battles, possibly unnecessary closed-cycle cooling system construction, and possibly meaningless environmental investigations. In addition, the administrative effort on the part of regulatory agencies seems out of proportion to the scale of the problem, especially when there are more dangerous pollutants which need more immediate administrative effort.

Unlike some pollution issues (e.g. air pollution from fossil-fuel power plants, coal-fired plants in particular), there seem to be no large-scale environmental effects, at this time, from the present mode of waste heat management, primarily once-through cooling. Furthermore, because heat does not stay permanently in the ecosystem or concentrate in the food chain, it cannot be a time bomb with a long fuse either. Therefore, it seems that the nation does not have to take immediate remedial action. A better policy might be to spend less effort on immediate waste heat management issues and more on long range planning and research for the time when the increasing number of power plants could cause a serious aquatic resource management problem.

Since July 1977, there has been a large amount of activity in the field of water pollution control -- including the passage of a new federal water pollution control law, the "Clean Water Act of 1977." This act did not effect thermal discharge regulation directly, but did make Section 316a type waivers available for newley defined "non-conventional" pollutants and for publically owned treatment works discharging into deep ocean water. Therefore, an understanding of EPA's approach to Section 316a waivers has a wider significance than for power plants alone. In addition, a

significant amount of new reports dealing with the cooling water issue have been published. Although they do not substantially effect the conclusions reached in Publication 5a, it should be updated to include them. Therefore, this research program is being concluded by updating Publication 5a and issuing it as a regular EQL publication.

PUBLICATIONS FROM PROJECT ELEMENT NO. 5

5a. M.S. Isaacson, "National Waste Heat Management Policy Issues," Draft Discussion Paper, Environmental Quality Laboratory, California Institute of Technology, Pasadena, California. July 1977.